DCCUMENT RESUME

ED 049 912 24 RE 003 628

AUTHOR	Jchnscn, Dale D.
TITLE	Factors Related to the Pronunciatıcn of Vowel Clusters. Part III (of 3 Parts).
INSTITUTION	Wisconsin Univ., Madison. Research and Develcpment Center fcr Ccgnitive Learning.
SPONS AGENCY	Office of Education (DHEW), Wasnington, D.C. Bureau of Research.
REPORT NO	TR-149-3
BUREAU NO	BR-5-0216
PUE DATE	Sep 70
CONTRACT	OEC-5-10-154
NOTE	86p.
EDRS PRICE	EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS	*Child Language, *Elementary Grades, Language Research, *Prcnunciatıcn, Reading Ability, Reading Research, *Vowels, *Word Recognitıcn

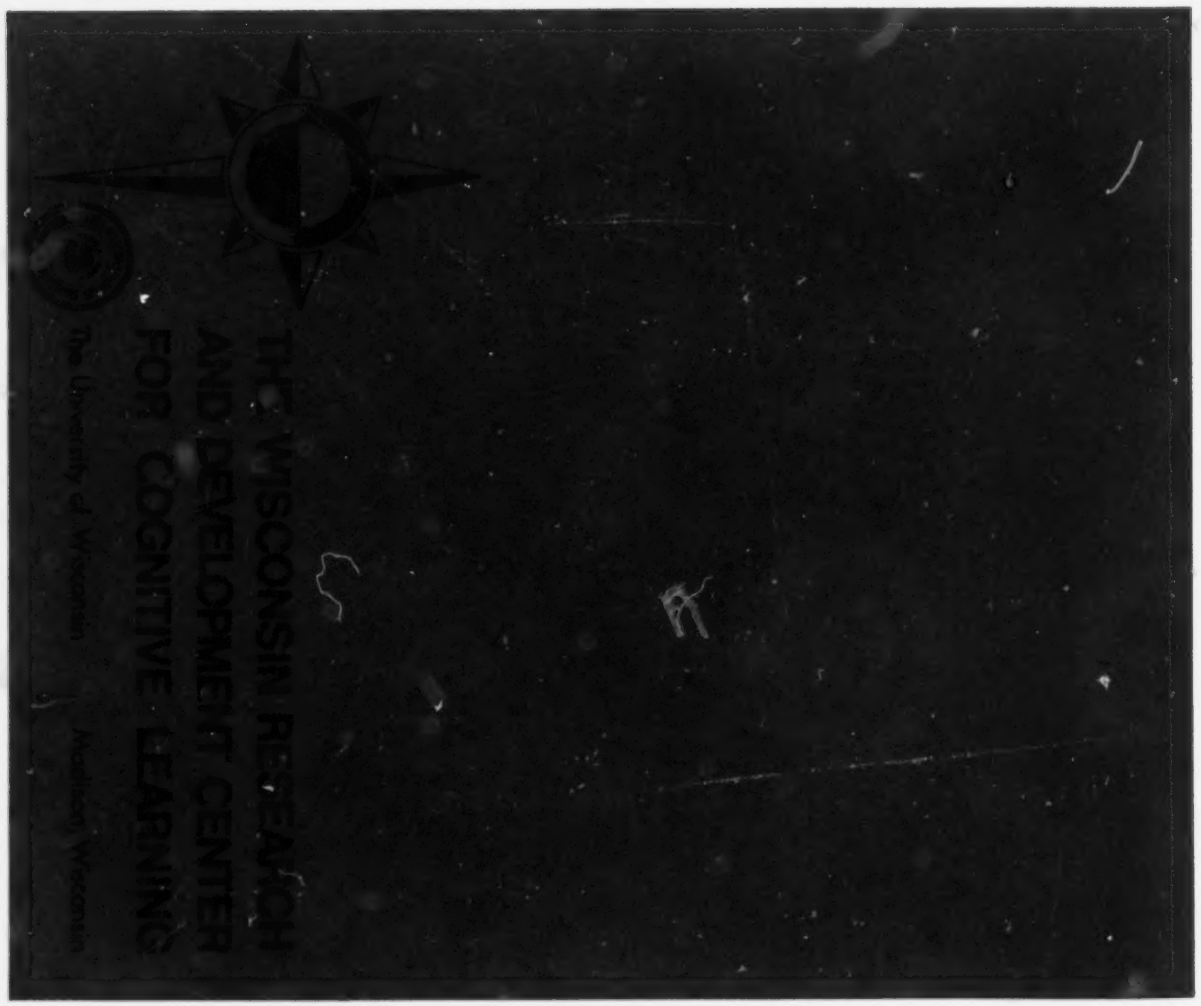
ABSTRACT

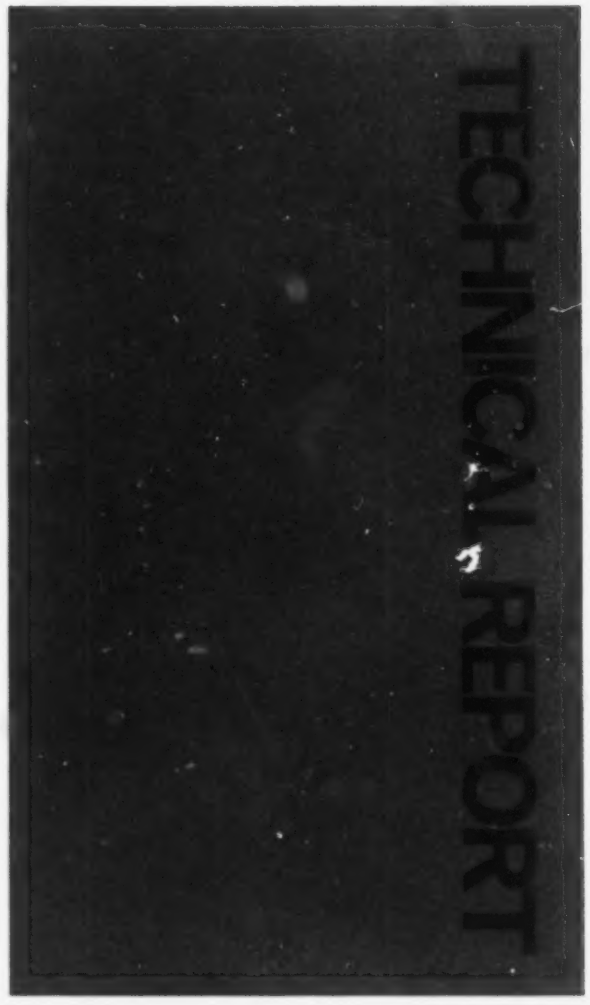
Children's pronunciatıcns of vowel clusters in synthetic words were analyzed in relatıcn to common English wcrds containing the same vcwel clusters. Subjects were 436 elementary students of both high and lcw reading levels from a suburban, an urban, and a rural ccmmunity. Discussıcn of the problem and prccedures of the study are found in Part 1, RE 003 626; results and conclusions are found in Part 2, RE 003 627. Part 3 contains the bibliography and nine appendixes: (A) International Phonetic Alphabet Symbols for Phonemes of American English; (B) Four Forms of Vcwel Cluster Multiple-Chcice Test Used with Pilct Studies A and B; (C) Four Forms of Vowel Cluster Multiple-Choice Test Used with the Study; (D) Waterloo Subject's Code Number, Sex, Grade Level, Reading Sccre, and IQ Score; (E) Study Subject's Code Number, Sex, Grade level, School, Reading Score, and IQ Score; (F) Summary of Reading Achievement Tests; Intelligence Tests, and Dates of Administratıcn to the Subjects of Pilct Studies A and B and the Study; (G) F Values of Main Effects and Interactions for Analysis One; (H) F Values of Main Effects and Interacticns fcr Analysis Two; and (I) Assumptions Underlying the Use of Analysis of Variance. (VJ)

RE003 628

ED049912

US Office of Education Center No C-03 Contract OE 5-10-154





ED049912

Technical Report No. 149 Part III

FACTORS RELATED TO THE PRONOUNCIATION OF VOWEL CLUSTERS

Report from the Project on Basic Pre-Reading Skills: Identification and Improvement

Richard L. Venezky, Principal Investigator

U. S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

By Dale D. Johnson

Thomas Barrett, Professor of Curriculum & Instruction,
Elementary Education
Chairman of Examining Committee

Wisconsin Research and Development
Center for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

September, 1970

This Technical Report is a doctoral dissertation reporting research supported by the Wisconsin Research and Development Center for Cognitive Learning. Since it has been approved by a University Examining Committee, it has not been reviewed by the Center. It is published by the Center as a record of some of the Center's activities and as a service to the student. The bound original is in The University of Wisconsin Memorial Library.

Published by the Wisconsin Research and Development Center for Cognitive Learning, supported in part as a research and development center by funds from the United States Office of Education, Department of Health, Education, and Welfare. The opinions expressed herein do not necessarily reflect the position or policy of the Office of Education and no official endorsement by the Office of Education should be inferred.

Center No. C-03 / Contract OE 5-10-154

NATIONAL EVALUATION COMMITTEE

Samuel Brownell
Professor of Urban Education
Graduate School
Yale University

Henry Chauncey
President
Educational Testing Service

Elizabeth Koontz
Women and Labor Standards
Administration, U.S.
Department of Labor
Washington

Patrick Suppes
Professor
Department of Mathematics
Stanford University

Launor F. Carter
Senior Vice President on
Technology and Development
System Development Corporation

Martin Deutsch
Director, Institute for
Developmental Studies
New York Medical College

Roderick McPhee
President
Punahou School, Honolulu

***Benton J. Underwood**
Professor
Department of Psychology
Northwestern University

Francis S. Chase
Professor
Department of Education
University of Chicago

Jack Edling
Director, Teaching Research
Division
Oregon State System of Higher
Education

G. Wesley Sowards
Director, Elementary Education
Florida State University

RESEARCH AND DEVELOPMENT CENTER POLICY REVIEW BOARD

Leonard Berkowitz
Chairman
Department of Psychology

Russell J. Hosler
Professor, Curriculum
and Instruction

Stephen C. Kleene
Dean, College of
Letters and Science

B. Robert Tabachnick
Chairman, Department
of Curriculum and
Instruction

Archie A. Buchmiller
Deputy State Superintendent
Department of Public Instruction

Clauston Jenkins
Assistant Director
Coordinating Committee for
Higher Education

Donald J. McCarty
Dean
School of Education

Henry C. Weinlick
Executive Secretary
Wisconsin Education Association

Robert E Grinder
Chairman
Department of Educational
Psychology

Herbert J. Klausmeier
Director, R & D Center
Professor of Educational
Psychology

Ira Sharkansky
Associate Professor of Political
Science

M. Crawford Young
Associate Dean
The Graduate School

EXECUTIVE COMMITTEE

Edgar F. Borgatta
Brittingham Professor of
Sociology

Robert E. Davidson
Assistant Professor,
Educational Psychology

Russell J. Hosler
Professor of Curriculum and
Instruction and of Business

Wayne Otto
Professor of Curriculum and
Instruction (Reading)

Anne E. Buchanan
Project Specialist
R & D Center

Frank H. Farley
Associate Professor,
Educational Psychology

***Herbert J. Klausmeier**
Director, R & D Center
Professor of Educational
Psychology

Robert G. Petzold
Associate Dean of the School
of Education
Professor of Curriculum and
Instruction and of Music

Robin S. Chapman
Research Associate
R & D Center

FACULTY OF PRINCIPAL INVESTIGATORS

Vernon L. Allen
Professor of Psychology

Frank H. Farley
Associate Professor of Educational
Psychology

James Moser
Assistant Professor of Mathematics
Education; Visiting Scholar

Richard L. Venezky
Assistant Professor of English
and of Computer Sciences

Ted Czajkowski
Assistant Professor of Curriculum
and Instruction

Lester S. Golub
Lecturer in Curriculum and
Instruction and in English

Wayne Otto
Professor of Curriculum and
Instruction (Reading)

Alan Voelker
Assistant Professor of Curriculum
and Instruction

Robert E. Davidson
Assistant Professor of
Educational Psychology

John G. Harvey
Associate Professor of
Mathematics and of Curriculum
and Instruction

Milton O. Pella
Professor of Curriculum and
Instruction (Science)

Larry Wilder
Assistant Professor of Curriculum
and Instruction

Gary A. Davis
Associate Professor of
Educational Psychology

Herbert J. Klausmeier
Director, R & D Center
Professor of Educational
Psychology

Thomas A. Romberg
Associate Director, R & D Center
Professor of Mathematics and of
Curriculum and Instruction

Peter Wolff
Assistant Professor of Educational
Psychology

M. Vere DeVault
Professor of Curriculum and
Instruction (Mathematics)

Donald Lange
Assistant Professor of Curriculum
and Instruction

B. Robert Tabachnick
Chairman, Department
of Curriculum and
Instruction

MANAGEMENT COUNCIL

Herbert J. Klausmeier
Director, R & D Center
V.A.C. Henmon Professor of
Educational Psychology

Thomas A. Romberg
Associate Director

James Walter
Director
Dissemination Program

Dan G. Woolpert
Director
Operations and Business

Mary R. Quilling
Director
Technical Development Program

* COMMITTEE CHAIRMAN

STATEMENT OF FOCUS

The Wisconsin Research and Development Center for Cognitive Learning focuses on contributing to a better understanding of cognitive learning by children and youth and to the improvement of related educational practices. The strategy for research and development is comprehensive. It includes basic research to generate new knowledge about the conditions and processes of learning and about the processes of instruction, and the subsequent development of research-based instructional materials, many of which are designed for use by teachers and others for use by students. These materials are tested and refined in school settings. Throughout these operations behavioral scientists, curriculum experts, academic scholars, and school people interact, insuring that the results of Center activities are based soundly on knowledge of subject matter and cognitive learning and that they are applied to the improvement of educational practice.

This Technical Report is from the Basic Pre-Reading Skills: Identification and Improvement Project in Program 1. General objectives of the Program are to generate new knowledge about concept learning and cognitive skills, to synthesize existing knowledge, and to develop educational materials suggested by the prior activities. Contributing to these Program objectives, this project's basic goal is to determine the processes by which children aged four to seven learn to read and to identify the specific reasons why many children fail to acquire this ability. Later studies will be conducted to find experimental techniques and tests for optimizing the acquisition of skills needed for learning to read.

ACKNOWLEDGMENTS

Like most other doctoral students, I owe more debts than I can ever repay, or even recall. Certain people, however, have been particularly helpful in the development of this thesis and with my graduate program in general.

I am very grateful to Dr. Thomas Barrett, my major professor, whose advice and support throughout my program and with this study have been invaluable. Sincere appreciation is expressed to Dr. Richard Venezky under whose guidance the idea for this study was developed and whose assistance and suggestions were very helpful. Both of these men gave me more of their time than I had any right to expect.

Gratitude is expressed to Dr. Robert Calfee, Dr. Robin Chapman, Dr. Ken Dulin, Dr. Albert Yee, and Dr. Richard Smith whose suggestions and advice were valuable in the design and preparation of this investigation. Thanks are also extended to Dr. Charles Scott, my minor professor, whose suggestions throughout my program were always useful.

I am indebted to my good friend and colleague, Dr. Robert Heidman, who helped me in so many ways during my three years in Madison.

I also wish to thank the students, teachers and administrators in the participating schools in Waterloo, Seneca, Cedarburg and Racine, Wisconsin, whose cooperation and support made this study possible.

Gratefulness is expressed to Mrs. Marilyn Mantei, Computer Programmer, and to the University of Wisconsin Computer Center for valuable assistance. The author is indebted to the Wisconsin Research and Development Center for Cognitive Learning for providing funding and special assistance throughout this study.

Special thanks are extended to Dr. Joe Strain, Dr. Naim Gupta, and Dr. Edward Merryman, all of Ball State University, for their help and encouragement.

I am grateful to Mrs. Sharon Volovsek, Mrs. Shirley McCormick, Mrs. Kathleen Hartung, Miss Cheryl Lee, and Mrs. Betty Merryman for clerical and typing assistance in the preparation of classroom materials and the several drafts of this manuscript.

Finally, my deepest gratitude is extended to my wife, Sandy, and to my children, Lisa, Julie and Kirk, whose patience, encouragement and understanding led to the successful completion of this program.

TABLE OF CONTENTS

Page

LIST OF TABLES vii
ABSTRACT xi
INTRODUCTION 1

Chapter

I. STATEMENT, BACKGROUND AND RATIONALE OF THE PROBLEM 3

Statement of the Problem 3
Background 4
Rationale for the Investigation 12
Definition of Terms 15

II. SELECTION OF VOWEL CLUSTERS 18

Analysis of Vowel Cluster Letter-Sound Correspondences . . 18
Selection of Vowel Clusters for Study 34
Letter-Sound Correspondences of the Nine Selected Vowel Clusters in the 1000 Most Frequent English Words . . . 35

III. DEVELOPMENT OF THE INSTRUMENT AND PROCEDURES OF THE STUDY . . 43

Development of the Experimental Oral and Multiple-Choice Instruments 43
Pilot Studies 47
Development of the Final Instrument 56
The Study 60
Summary of the Study 72

IV. RESULTS AND DISCUSSIONS 73

Analysis One: Relationships Between Children's Pronunciations of Selected Vowel Clusters and the Letter-Sound Correspondences of Vowel Clusters in the Modified Thorndike 20,000 Word List (Type Corpus) . . . 73
Analysis Two: Relationships Between Children's Pronunciation of Selected Vowel Clusters and the Principal and Secondary Pronunciation of Such Vowel Clusters in the Kucera-Francis 1,000 Word List (Token Corpus). . 90
Relationships Between Subjects' Pronunciations of Vowel Clusters and the Vowel Cluster Pronunciation Frequencies on the Type and Token Corpora 105
Effects of Consonant Environment on Vowel Cluster Pronunciations 111
Effects of Word Position on Vowel Cluster Pronunciation. . 115
Summary of Contextual Features 116
Summary of Results of the Study 117

V. SUMMARY AND CONCLUSIONS 119

Summary 119
Conclusions and Implications 128

APPENDIX A 136

APPENDIX B 140

APPENDIX C 153

APPENDIX D 166

APPENDIX E 170

APPENDIX F 190

APPENDIX G 193

APPENDIX H 197

APPENDIX I 201

BIBLIOGRAPHY 204

LIST OF TABLES

Table		Page
2:01	Frequency of Vowel Clusters in 20,000 Word Corpus	20
2:02	Frequency of Occurrences of Vowel Clusters and the Numbers of Sounds they Represent	20
2:03	Monosyllabic and Disyllabic Status of the 30 Most Common Vowel Clusters	24
2:04	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ai	26
2:05	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster au	26
2:06	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ay	27
2:07	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ea	27
2:08	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ee	28
2:09	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ia	28
2:10	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ie	29
2:11	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster io	29
2:12	Frequency of Occurrence of the 5 Most Common Pronunciations of the Vowel Cluster iou	30
2:13	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster oa	30
2:14	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster oi	31
2:15	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster oo	31
2:16	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ou	32
2:17	Frequency of Occurrence of the 3 Most Common Pronunciations of the Vowel Cluster ow	32

2:18	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ua	33
2:19	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ue	33
2:20	Frequency of Occurrence of the 4 Most Common Pronunciations of the Vowel Cluster ui	34
2:21	A Comparison of Vowel Cluster Pronunciation Proportions in the 20,000 Word and 1,000 Word Corpora	38
2:22	Word Positions of the 9 Selected Vowel Clusters in the 20,000 Word Corpus	42
3:01	An Example of Test Form, Item Number and Response Sequence of Two Synthetic Words	47
3:02	Pilot Study B: Mean Reading Score for Each Cell by Grade Level, Sex and Reading Ability	50
3:03	Testing Sequences - Pilot Study B	51
3:04	F Values of Main Effects and Interactions for Pilot Study B	53
3:05	Oral-Multiple-Choice Agreement Means by Vowel Cluster Where Ten Items Were Used for Each Cluster	55
3:06	Oral-Multiple-Choice Agreement Means by Reading Level Where Ten Items Were Used for Each Vowel Cluster	55
3:07	Oral-Multiple-Choice Agreement Means by Grade Level Where Ten Items Were Used for Each Vowel Cluster	56
3:08	The Three Most Frequent Oral Pronunciations of Each Vowel Cluster Made by Pilot Study B Subjects	57
3:09	The Four Phonemic Response Choices for Each Vowel Cluster on the Modified Multiple-Choice Instrument	59
3:10	Principal and Secondary Pronunciation Proportions of the Nine Vowel Clusters on the Type and Token Corpora	59
3:11	Distribution of Subjects by Community, Grade and Sex	62

4:17	Token Corpus Difference Means by Grade Level	93
4:18	Duncan's New Multiple Range Test Applied to Token Corpus Means by Grade Level	94
4:19	Token Corpus Difference Scores by Reading Level	95
4:20	Token Corpus Difference Means by Community Type	96
4:21	Duncan's New Multiple Range Test Applied to Token Corpus Means by Community Type	96
4:22	Token Corpus Difference Means by Grade Level and Community Type	97
4:23	Token Corpus Difference Means by Vowel Cluster	99
4:24	Token Corpus Difference Scores by Response Type	100
4:25	Token Corpus Difference Means by Vowel Clusters and Response Types	100
4:26	Token Corpus Difference Means by Grade Level and Vowel Cluster	102
4:27	Token Corpus Difference Means by Grade Level and Response Type	103
4:28	Token Corpus Difference Means by Reading Level and Response Type	103
4:29	Token Corpus Difference Means by Community Type and Response Type	104
4:30	Per Cent of Vowel Cluster Pronunciations by all 436 Subjects	106
4:31	The Most Frequent Pronunciation of Each Vowel Cluster by all Subjects and Their Positions on the Type and Token Corpora	109
4:32	Pronunciation Percentages of Sample Synthetic Words by all Subjects	112
4:33	Pronunciation Percentages for Synthetic Words Receiving the Fewest Principal Pronunciations and the Most Principal Pronunciations	114
4:34	The Influence of Word Position on the ow /o/ Correspondence	116

3:12	The 436 Subjects in the Study by Class, Grade, School, District, and Median Reading Scores by Sex	64
3:13	Testing Sequence During the Study	65
4:01	Analysis of Variance F Values of Main Effects and First Order Interactions for Analysis One: Type Corpus Relationship	75
4:02	Type Corpus Difference Means by Grade Level	77
4:03	Duncan's New Multiple Range Test Applied to Type Corpus Means by Grade Level	77
4:04	Type Corpus Difference Means by Reading Level	79
4:05	Type Corpus Difference Means by Community Type	79
4:06	Duncan's New Multiple Range Test Applied to Type Corpus Means by Community Type	80
4:07	Type Corpus Difference Means by Grade Level and Community Type	81
4:08	Type Corpus Difference Means by Vowel Cluster	82
4:09	Type Corpus Difference Means by Vowel Cluster and Response Type	84
4:10	Type Corpus Difference Means by Grade Level and Vowel Cluster	85
4:11	Type Corpus Difference Means by Sex and Vowel Cluster	86
4:12	Type Corpus Difference Means by Reading Level and Vowel Cluster	87
4:13	Type Corpus Difference Means by Grade Level and Response Type	88
4:14	Type Corpus Difference Means by Reading Level and Response Type	89
4:15	Type Corpus Difference Means by Community Type and Response Type	89
4:16	Analysis of Variance F Values of Between Cells Main Effects and First Order Interactions for Analysis Two = Token Corpus Relationships	91

ABSTRACT

Statement of the Problem

The purpose of this study was to determine the pronunciations children give to synthetic words containing vowel cluster spellings, and to analyze the observed pronunciations in relation to common English words containing the same vowel clusters. The pronunciations associated with vowel cluster spellings are among the most unpredictable letter-sound correspondences in English. If learning to read includes learning to translate from spelling to sound, then vowel clusters should pose a particularly difficult problem for children. Determining the manner in which children solve this problem--i.e., the factors related to children's pronunciations of vowel clusters in unfamiliar words--could shed more general light on this complex decoding act.

The study dealt with the following independent variables: grade level (second, fourth, and sixth), sex, reading level (high and low), community type (suburban, urban, and rural), vowel cluster (a subset of nine--ai, au, ay, ea, ie, oa, oo, ou, and ow), and response type (principal and secondary). The dependent variables were difference scores between the subjects' principal and secondary pronunciations of vowel clusters and the principal and secondary pronunciation proportions of vowel clusters on two corpora--a 1963 modification of the 20,000 most common words on the Thorndike Frequency count (Type Corpus) and the most frequent 1,000 words on the 1967 Kucera and Francis computational analysis of present-day American English (Token Corpus).

Procedures

Two pilot studies were conducted to refine and modify the testing instrument, a 100 item multiple choice test. The instrument included 90 synthetic words containing vowel clusters, (ten synthetic words for each of the nine selected vowel clusters) and ten check items. Four real word distractors contained the major pronunciations for the vowel cluster on the type and token corpora.

The sample consisted of 436 elementary pupils from a suburban an urban, and a rural community, all in Wisconsin. Second, fourth and sixth grade boys and girls of both high and low reading levels were included. Each subject responded to two 50 item halves of the instrument on two consecutive days.

To test twelve hypotheses and answer three questions two analyses were performed. In each analysis the design was a 3 x 2 x 2 x 3 x 8 (or 7) x 2 analysis of variance, in which the main effects were grade, sex, reading level, community type, vowel cluster (eight on the type analysis and seven on the token analysis) and response type.

Results

1. Grade level was significantly related to vowel cluster pronunciation. There was an upward progression from second to sixth grade in the proportion of principal vowel cluster pronunciations given in both analyses.

2. There were no significant sex differences in either analysis.

3. Subjects of high reading level consistently gave more principal pronunciations to vowel clusters in both analyses than the poorer readers.

4. Suburban subjects tended to give the principal pronunciations of vowel clusters more consistently than urban and rural subjects.

5. Subjects' pronunciations were more closely related to word types than to word tokens, particularly to the principal pronunciations in the type corpus.

6. Word configuration seemed related to vowel cluster pronunciations.

Conclusions

1. As children progress through the grades, their vowel cluster pronunciations more closely parallel the correspondences occurring in common English words.

2. Being a preference inventory, not a test of "correctness", sex differences were not significant.

3. Better readers are less deviant from correspondences in common words in their pronunciation of vowel clusters than are poorer readers.

4. Suburban children tend to more closely approximate the vowel cluster correspondence frequencies in common words than urban and rural pupils.

5. Principal pronunciations of vowel clusters in word types relate more closely to children's pronunciations than do the correspondences in word tokens.

6. Contextual environment and word position seem to influence vowel cluster pronunciations by children.

APPENDICES

Appendix A

International Phonetic Alphabet Symbols

for Phonemes of American English

International Phonetic Alphabet Symbols

for Phonemes of American English

Vowels

Phonemic Symbol	Representative Word	Qualification
/i/	bee	
/ɪ/	bit	
/e/	date	
/ɛ/	yet	
/æ/	hat	
/a/	bath	Used in Eastern U.S. between /æ/ and /ɑ/
/ɑ/	hot	
/ɔ/	jaw	
/o/	go	
/ʊ/	full	
/u/	mood	
/ə/	above	Unaccented syllable only
/ʌ/	above	Accented syllable only

Diphthongs

/ai/	while
/au/	how
/ɔi/	boy
/ju/	fuse

International Phonetic Alphabet Symbols

for Phonemes of American English, cont.

Consonants

Phonemic Symbol	Representative Word
/p/	pin
/b/	big
/t/	team
/d/	dish
/k/	cat
/g/	go
/f/	fall
/v/	vision
/θ/	breath
/ð/	breathe
/s/	sang
/z/	using
/ʃ/	dish
/ʒ/	vision
/h/	happy
/ts/	watch
/dʒ/	gym
/m/	meat
/n/	new
/ŋ/	angry

International Phonetic Alphabet Symbols

for Phonemes of American English, cont.

Phonemic Symbol	Representative Word
/l/	full
/w/	watch
/hw/	while
/j/	yet
/r/	rate

Appendix B

Four Forms of Vowel Cluster Multiple-Choice Test

Used With Pilot Studies A and B

COMPOUND VOWELS - MULTIPLE-CHOICE TEST - LIST A-1

This is a test of how you pronounce unfamiliar English words. At the far left of each page, in every row of the test, there is a short English-like word that you probably have never seen before. On the right, in each row, there are three words that you already know how to say. First decide how you would say the new word on the left, and notice what sound you make for the underlined letter. Then circle the word on the right that has that same sound for its underlined letters.

Here are three examples:

A.	mip	him	bed	go
B.	gan	let	call	dad
C.	pode	baby	no	cow

As you work through the test be careful to check which letters are underlined in each word. It could be any one of them or two together.

These are the words you know that will be on the test. Listen to the sound of the underlined letters as you read these words with me.

go	let	put	saw	gave	took	house
no	but	dad	new	baby		
be	ran	try	cow	come		
my	call					
we	bed					
to	him					
	pin					

1.	thaim	let	but	gave
2.	chause	ran	call	go
3.	polead	be	bed	baby
4.	tay	him	gave	bed
5.	coad	saw	cow	no
6.	pid	him	pin	but
7.	abiek	my	bed	we
8.	monood	new	put	but
9.	coudry	cow	took	hew
10.	frowl	call	house	go
11.	man	saw	baby	dad
12.	pokay	pin	gave	be
13.	kaidon	let	him	gave
14.	saut	cow	ran	call
15.	dease	be	let	baby
16.	mullow	took	go	house
17.	manous	but	cow	put
18.	yook	to	put	come
19.	yiet	try	we	bed
20.	smoal	cow	no	saw
21.	droon	but	new	put
22.	slaum	go	saw	ran
23.	oan	house	to	no
24.	dat	bed	took	pin
25.	bease	we	gave	let

26.	ploub	put	to	now
27.	comiel	be	baby	let
28.	gowl	no	house	saw
29.	chaig	bed	we	baby
30.	betay	my	gave	we
31.	feel	him	bed	be
32.	baish	gave	be	try
33.	trould	no	put	new
34.	vayt	pin	let	gave
35.	wies	try	pin	be
36.	theat	baby	be	let
37.	aclow	house	call	no
38.	broam	saw	go	new
39.	naugh	ran	saw	cow
40.	frool	to	put	call
41.	goag	cow	no	saw
42.	cote	house	to	go
43.	porie	my	we	him
44.	dusaig	bed	gave	be
45.	bloose	go	put	new
46.	ays	try	gave	let
47.	ealod	bed	we	gave
48.	fough	no	cow	new
49.	haup	call	go	cow
50.	zown	go	call	house

COMPOUND VOWELS - MULTIPLE-CHOICE TEST - LIST A-2

This is a test of how you pronounce unfamiliar English words. At the far left of each page, in every row of the test, there is a short English-like word that you probably have never seen before. On the right, in each row, there are three words that you already know how to say. First decide how you would say the new word on the left, and notice what sound you make for the underlined letter. Then circle the word on the right that has that same sound for its underlined letters.

Here are three examples:

A. mip him bed go

B. gan let call dad

C. pode baby no cow

As you work through the test be careful to check which letters are underlined in each word. It could be any one of them or two together.

These are the words you know that will be on the test. Listen to the sound of the underlined letters as you read these words with me.

go let put saw gave took house

no but dad new baby

be ran try cow come

my call

we bed

to him

pin

1.	saut	cow	call	ran
2.	porie	we	my	him
3.	ays	try	gave	let
4.	coad	cow	saw	no
5.	frowl	house	call	go
6.	oan	no	to	house
7.	dease	let	be	baby
8.	smoal	cow	saw	no
9.	pid	but	him	pin
10.	ealod	gave	bed	we
11.	manous	put	cow	but
12.	yook	come	to	put
13.	thaim	but	let	gave
14.	fough	cow	no	new
15.	bloose	put	new	go
16.	vayt	pin	gave	let
17.	zown	call	house	go
18.	dat	bed	pin	took
19.	baish	gave	try	be
20.	frool	put	call	to
21.	theat	let	be	baby
22.	aclow	no	house	call
23.	haup	call	cow	go
24.	wies	pin	be	try
25.	gowl	house	saw	no

26.	kaidon	let	gave	him
27.	ploub	now	put	to
28.	droon	new	but	put
29.	abiek	bed	my	we
30.	cote	house	go	to
31.	coudry	took	cow	new
32.	naugh	cow	saw	ran
33.	pokay	gave	pin	be
34.	broam	go	saw	new
35.	slaum	saw	go	ran
36.	mullow	house	took	go
37.	feel	be	bed	him
38.	betay	we	my	gave
39.	bease	gave	we	let
40.	goag	cow	saw	no
41.	chaig	we	bed	baby
42.	trould	put	no	new
43.	dusaig	bed	be	gave
44.	chause	call	ran	go
45.	comiel	be	let	baby
46.	monood	put	but	new
47.	man	baby	dad	saw
48.	yiet	bed	try	we
49.	tay	him	bed	gave
50.	polead	be	baby	bed

COMPOUND VOWELS - MULTIPLE-CHOICE TEST - LIST B-1

This is a test of how you pronounce unfamiliar English words. At the far left of each page, in every row of the test, there is a short English-like word that you probably have never seen before. On the right, in each row, there are three words that you already know how to say. First decide how you would say the new word on the left, and notice what sound you make for the underlined letter. Then circle the word on the right that has that same sound for its underlined letters.

Here are three examples:

A.	m<u>i</u>p	h<u>i</u>m	b<u>e</u>d	g<u>o</u>
B.	g<u>a</u>n	l<u>e</u>t	c<u>a</u>ll	d<u>a</u>d
C.	p<u>o</u>de	b<u>a</u>by	n<u>o</u>	c<u>ow</u>

As you work through the test be careful to check which letters are underlined in each word. It could be any one of them or two together.

These are the words you know that will be on the test. Listen to the sound of the underlined letters as you read these words with me.

g<u>o</u>	l<u>e</u>t	p<u>u</u>t	s<u>aw</u>	g<u>a</u>ve	t<u>oo</u>k	h<u>ou</u>se
n<u>o</u>	b<u>u</u>t	d<u>a</u>d	n<u>ew</u>	b<u>a</u>by		
b<u>e</u>	r<u>a</u>n	tr<u>y</u>	c<u>ow</u>	c<u>o</u>me		
m<u>y</u>	c<u>a</u>ll					
w<u>e</u>	b<u>e</u>d					
t<u>o</u>	h<u>i</u>m					
	p<u>i</u>n					

1.	boys	baby	him	took
2.	loat	cow	saw	no
3.	chays	try	gave	let
4.	sprow	house	call	go
5.	houn	put	cow	but
6.	areak	let	be	baby
7.	mauf	cow	call	ran
8.	thood	come	put	to
9.	mief	we	my	him
10.	ogaim	my	let	gave
11.	stappow	call	house	go
12.	trak	took	gave	to
13.	gies	pin	be	try
14.	poad	go	saw	new
15.	poom	put	but	to
16.	konay	pin	gave	let
17.	koump	cow	no	new
18.	laip	my	let	gave
19.	fead	let	be	baby
20.	paud	call	cow	go
21.	blay	him	bed	gave
22.	yoap	cow	saw	no
23.	blue	new	no	saw
24.	poup	but	cow	put
25.	mook	go	to	put

26.	prient	bed	my	we
27.	trown	house	saw	no
28.	deach	bed	be	baby
29.	aucol	cow	saw	ran
30.	taise	gave	him	try
31.	frean	let	we	gave
32.	wouth	now	put	to
33.	sunt	dad	him	saw
34.	spows	go	took	house
35.	hauge	saw	go	ran
36.	sloot	new	but	put
37.	blaing	let	gave	him
38.	toang	go	saw	new
39.	ziegle	bed	my	we
40.	onchay	we	my	gave
41.	fowt	go	house	but
42.	biesh	bed	try	we
43.	toul	took	cow	new
44.	saw	call	no	dad
45.	boase	go	cow	saw
46.	ducay	him	bed	gave
47.	raitel	gave	ran	try
48.	voop	put	but	new
49.	aup	call	house	dad
50.	cheam	be	baby	bed

COMPOUND VOWELS - MULTIPLE-CHOICE TEST - LIST B-2

This is a test of how you pronounce unfamiliar English words. At the far left of each page, in every row of the test, there is a short English-like word that you probably have never seen before. On the right, in each row, there are three words that you already know how to say. First decide how you would say the new word on the left, and notice what sound you make for the underlined letter. Then circle the word on the right that has that same sound for its underlined letters.

Here are three examples:

A.	mip	him	bed	go
B.	gan	let	call	dad
C.	pode	baby	no	cow

As you work through the test be careful to check which letters are underlined in each word. It could be any one of them or two together.

These are the words you know that will be on the test. Listen to the sound of the underlined letters as you read these words with me.

go	let	put	saw	gave	took	house
no	but	dad	new	baby		
be	ran	try	cow	come		
my	call					
we	bed					
to	him					
	pin					

1.	onchay	gave	we	my
2.	aucol	no	cow	saw
3.	spows	took	house	go
4.	ogaim	my	gave	let
5.	prient	my	bed	we
6.	frean	we	gave	let
7.	biesh	try	we	bed
8.	trak	gave	took	to
9.	stappow	go	call	house
10.	paud	cow	go	call
11.	raitel	try	gave	ran
12.	mauf	call	ran	cow
13.	trown	saw	no	house
14.	thood	to	come	put
15.	deach	baby	bed	be
16.	ducay	gave	him	bed
17.	blue	no	saw	new
18.	voop	but	new	put
19.	aup	dad	call	house
20.	toul	new	took	cow
21.	blaing	him	let	gave
22.	fead	be	baby	let
23.	chays	gave	let	try
24.	loat	saw	no	cow
25.	sloot	put	new	but

26.	konay	gave	let	pin
27.	sunt	him	saw	dad
28.	taise	try	gave	him
29.	poad	saw	new	go
30.	wouth	put	to	now
31.	chean	bed	be	baby
32.	mook	to	put	go
33.	hauge	go	ran	saw
34.	toang	go	saw	new
35.	mief	him	we	my
36.	boys	took	baby	him
37.	fowt	but	go	house
38.	areak	be	baby	let
39.	saw	dad	call	no
40.	poup	cow	put	but
41.	boase	go	cow	saw
42.	blay	him	bed	gave
43.	poom	but	to	put
44.	koump	no	new	cow
45.	gies	try	pin	be
46.	houn	cow	put	but
47.	yoap	saw	no	cow
48.	laip	gave	my	let
49.	ziegle	my	we	bed
50.	sprow	call	house	go

Appendix C

Four Forms of Vowel Cluster Multiple-Choice Test Used With the Study

COMPOUND VOWELS - MULTIPLE-CHOICE TEST - LIST A-1

This is a test of how you pronounce unfamiliar English words. At the far left of each page, in every row of the test, there is a short English-like word that you probably have never seen before. On the right, in each row, there are four words that you already know how to say. First decide how you would say the new word on the left, and notice what sound you make for the underlined letter. Then circle the word on the right that has that same sound for its underlined letters.

Here are three examples:

A.	m<u>i</u>p	h<u>i</u>m	b<u>e</u>d	g<u>o</u>	s<u>ay</u>
B.	g<u>a</u>n	l<u>e</u>t	c<u>a</u>ll	d<u>a</u>d	s<u>o</u>
C.	p<u>o</u>de	b<u>a</u>by	n<u>o</u>	c<u>ow</u>	m<u>e</u>

As you work through the test be careful to check which letters are underlined in each word. It could be any one of them or two together.

These are the words you know that will be on the test. Listen to the sound of the underlined letters as you read these words with me.

p<u>u</u>t	g<u>a</u>ve	n<u>o</u>	b<u>u</u>t	b<u>e</u>
r<u>a</u>n	c<u>ow</u>	m<u>y</u>	b<u>a</u>ll	t<u>o</u>p
<u>ou</u>t	b<u>e</u>d	t<u>o</u>	h<u>i</u>m	

1.	thaim	my	bed	him	gave
2.	chause	ran	ball	no	cow
3.	polead	but	be	bed	gave
4.	tay	my	him	gave	bed
5.	coad	ball	cow	top	no
6.	pid	him	my	put	but
7.	abiek	my	bed	be	him
8.	monood	no	to	put	but
9.	coudry	cow	but	to	put
10.	frowl	ball	top	out	no
11.	man	him	ball	gave	ran
12.	pokay	my	bed	gave	him
13.	kaidon	gave	my	him	bed
14.	saut	cow	ran	ball	no
15.	dease	be	but	bed	gave
16.	mullow	ball	out	top	no
17.	manous	to	but	cow	put
18.	yook	to	no	put	but
19.	yiet	my	we	him	bed
20.	smoal	top	cow	no	ball
21.	droon	no	but	to	put
22.	slaum	no	cow	ball	ran
23.	oan	ball	cow	top	no
24.	dat	put	bed	no	ran
25.	bease	be	but	gave	bed

26.	ploub	put	to	cow	but
27.	comiel	my	be	him	bed
28.	gowl	no	top	out	ball
29.	chaig	bed	my	gave	him
30.	betay	gave	my	him	bed
31.	feel	him	be	bed	my
32.	baish	him	gave	my	bed
33.	trould	to	but	put	cow
34.	vayt	bed	gave	my	him
35.	wies	my	him	bed	be
36.	theat	gave	be	but	bed
37.	aclow	top	out	ball	no
38.	broam	cow	ball	no	top
39.	naugh	ran	no	ball	cow
40.	frool	no	to	but	put
41.	goag	top	cow	ball	no
42.	cote	no	top	to	out
43.	porie	my	be	bed	him
44.	dusaig	him	bed	my	gave
45.	bloose	to	put	no	but
46.	ays	bed	my	gave	him
47.	ealod	bed	be	gave	but
48.	fough	to	but	cow	put
49.	haup	no	ball	ran	cow
50.	zown	out	no	ball	top

COMPOUND VOWELS - MULTIPLE-CHOICE TEST - LIST A-2

This is a test of how you pronounce unfamiliar English words. At the far left of each page, in every row of the test, there is a short English-like word that you probably have never seen before. On the right, in each row, there are four words that you already know how to say. First decide how you would say the new word on the left, and notice what sound you make for the underlined letter. Then circle the word on the right that has that same sound for its underlined letters.

Here are three examples:

A.	mip	him	bed	go	say
B.	gan	let	call	dad	so
C.	pode	baby	no	cow	me

As you work through the test be careful to check which letters are underlined in each word. It could be any one of them or two together.

These are the words you know that will be on the test. Listen to the sound of the underlined letters as you read these words with me.

put	gave	no	but	be
ran	cow	my	ball	top
out	bed	to	him	

1.	saut	no	cow	ball	ran
2.	porie	be	bed	my	him
3.	ays	my	gave	him	bed
4.	coad	cow	ball	no	top
5.	frowl	top	out	ball	no
6.	oan	no	ball	top	cow
7.	dease	bed	be	but	gave
8.	smoal	cow	ball	top	no
9.	pid	but	him	put	my
10.	ealod	but	gave	bed	be
11.	manous	put	to	cow	but
12.	yook	but	to	no	put
13.	thaim	him	bed	gave	my
14.	fough	put	cow	but	to
15.	bloose	put	but	to	no
16.	vayt	him	gave	bed	my
17.	zown	top	ball	out	no
18.	dat	bed	no	put	cow
19.	baish	gave	my	bed	him
20.	frool	no	put	but	to
21.	theat	but	bed	be	gave
22.	aclow	no	top	out	ball
23.	haup	ball	cow	ran	no
24.	wies	him	be	my	bed
25.	gowl	top	out	ball	no

26.	kaidon	bed	my	gave	him
27.	ploub	cow	put	but	to
28.	droon	to	but	put	no
29.	abiek	him	bed	my	be
30.	cote	cow	ran	no	to
31.	coudry	put	cow	but	to
32.	naugh	cow	ball	ran	no
33.	pokay	my	gave	him	bed
34.	broam	no	top	ball	cow
35.	slaum	ball	no	cow	ran
36.	mullow	out	top	no	ball
37.	feel	to	be	bed	him
38.	betay	him	bed	my	gave
39.	bease	gave	we	but	bed
40.	goag	cow	ball	no	top
41.	chaig	my	him	bed	gave
42.	trould	put	but	cow	to
43.	dusaig	bed	him	gave	my
44.	chause	cow	ball	ran	no
45.	comiel	be	my	bed	him
46.	monood	put	but	no	to
47.	man	gave	ran	ball	him
48.	yiet	him	bed	my	be
49.	tay	him	my	bed	gave
50.	polead	be	gave	but	bed

COMPOUND VOWELS - MULTIPLE-CHOICE TEST - LIST B-1

This is a test of how you pronounce unfamiliar English words. At the far left of each page, in every row of the test, there is a short English-like word that you probably have never seen before. On the right, in each row, there are four words that you already know how to say. First decide how you would say the new word on the left, and notice what sound you make for the underlined letter. Then circle the word on the right that has that same sound for its underlined letters.

Here are three examples:

A.	mip	him	bed	go	say
B.	gan	let	call	dad	so
C.	pode	baby	no	cow	me

As you work through the test be careful to check which letters are underlined in each word. It could be any one of them or two together.

These are the words you know that will be on the test. Listen to the sound of the underlined letters as you read these words with me.

put	gave	no	but	be
ran	cow	my	ball	top
out	bed	to	him	

1.	boys	gave	bed	him	to
2.	loat	cow	ball	no	top
3.	chays	him	my	gave	bed
4.	sprow	out	top	ball	no
5.	houn	put	cow	to	but
6.	areak	bed	be	gave	but
7.	mauf	no	cow	ball	ran
8.	thood	but	no	put	to
9.	mief	be	my	bed	him
10.	ogaim	my	bed	gave	him
11.	stappow	top	ball	out	no
12.	trak	put	cow	gave	no
13.	gies	him	bed	be	my
14.	poad	no	ball	top	cow
15.	poom	put	but	to	no
16.	konay	my	him	gave	bed
17.	koump	cow	put	but	to
18.	laip	my	bed	gave	him
19.	fead	but	bed	be	gave
20.	paud	ball	ran	cow	no
21.	blay	him	bed	my	gave
22.	yoap	cow	ball	no	top
23.	blue	put	to	no	ball
24.	poup	but	to	cow	put
25.	mook	no	to	but	put

26.	prient	bed	my	be	him
27.	trown	top	out	ball	no
28.	deach	bed	but	be	gave
29.	aucol	cow	ball	no	ran
30.	taise	gave	him	my	bed
31.	frean	but	bed	be	gave
32.	wouth	cow	but	put	to
33.	sunt	ran	be	him	put
34.	spows	no	ball	top	out
35.	hauge	ball	no	ran	cow
36.	sloot	no	to	but	put
37.	blaing	bed	my	gave	him
38.	toang	no	ball	top	cow
39.	ziegle	bed	my	be	him
40.	onchay	him	bed	my	gave
41.	fowt	no	ball	out	top
42.	biesh	him	bed	my	be
43.	toul	put	but	cow	to
44.	saw	ball	no	to	ran
45.	boase	no	cow	ball	top
46.	ducay	my	him	bed	gave
47.	raitel	gave	bed	him	my
48.	voop	put	but	no	to
49.	aup	no	ball	cow	ran
50.	cheam	but	be	gave	bed

COMPOUND VOWELS - MULTIPLE-CHOICE TEST - LIST B-2

This is a test of how you pronounce unfamiliar English words. At the far left of each page, in every row of the test, there is a short English-like word that you probably have never seen before. On the right, in each row, there are four words that you already know how to say. First decide how you would say the new word on the left, and notice what sound you make for the underlined letter. Then circle the word on the right that has that same sound for its underlined letters.

Here are three examples:

A.	mip	him	bed	go	say
B.	gan	let	call	dad	so
C.	pode	baby	no	cow	me

As you work through the test be careful to check which letters are underlined in each word. It could be any one of them or two together.

These are the words you know that will be on the test. Listen to the sound of the underlined letters as you read these words with me.

put	gave	no	but	be
ran	cow	my	ball	bed
to	him	out	bed	

1.	onchay	gave	him	my	bed
2.	aucol	no	ran	cow	ball
3.	spows	out	ball	top	no
4.	ogaim	him	my	bed	gave
5.	prient	my	bed	him	be
6.	frean	be	but	gave	bed
7.	biesh	my	be	bed	him
8.	trak	gave	no	put	cow
9.	stappow	no	top	ball	out
10.	paud	cow	no	ball	ran
11.	raitel	him	my	gave	bed
12.	mauf	ball	ran	cow	no
13.	trown	ball	no	out	top
14.	thood	put	to	no	but
15.	deach	gave	but	bed	be
16.	ducay	gave	my	him	bed
17.	blue	no	ball	to	put
18.	voop	but	no	to	put
19.	aup	ran	ball	no	cow
20.	toul	to	put	cow	but
21.	blaing	my	him	bed	gave
22.	fead	be	gave	bed	but
23.	chays	bed	gave	him	my
24.	loat	ball	top	no	cow
25.	sloot	put	to	no	but

26.	konay	gave	my	bed	him
27.	sunt	him	put	be	ran
28.	taise	my	gave	bed	him
29.	poad	ball	cow	top	no
30.	wouth	put	to	cow	but
31.	cheam	bed	gave	be	but
32.	mook	to	put	no	but
33.	hauge	cow	no	ran	ball
34.	toang	ball	no	cow	top
35.	mief	him	be	bed	my
36.	boys	to	gave	him	bed
37.	fowt	ball	top	no	out
38.	areak	be	gave	bed	but
39.	saw	ran	no	ball	to
40.	poup	cow	put	but	to
41.	boase	top	no	cow	ball
42.	blay	my	him	bed	gave
43.	poom	no	but	to	put
44.	koump	but	to	put	cow
45.	gies	my	him	be	bed
46.	houn	cow	to	put	but
47.	yoap	ball	top	no	cow
48.	laip	bed	gave	my	him
49.	ziegle	him	my	be	bed
50.	sprow	no	ball	top	out

Appendix D

Pilot Study B

Waterloo Subject's Code Number, Sex, Grade Level,

Reading Score, and IQ Score

Waterloo Subject's Code Number, Sex, Grade Level,

Reading Grade Level and IQ Score

Code	Sex	Grade	Reading Score*	IQ Score*
1	M	2	3.1	107
2	M	2	3.4	124
3	M	2	3.0	116
4	M	2	3.2	109
5	F	2	3.4	103
6	F	2	3.2	109
7	F	2	3.4	110
8	F	2	3.0	No score
9	M	2	2.5	83
10	M	2	2.4	116
11	M	2	2.0	106
12	M	2	1.9	88
13	F	2	2.6	109
14	F	2	2.6	115
15	F	2	2.3	93
16	F	2	2.2	97
17	M	4	7.9	129
18	M	4	5.4	100
19	M	4	6.2	127

* See Appendix F

Waterloo Subject's Code Number, Sex, Grade Level,

Reading Grade Level and IQ Score, cont.

Code	Sex	Grade	Reading Score*	IQ Score*
20	M	4	4.7	117
21	F	4	6.2	131
22	F	4	5.8	118
23	F	4	5.0	106
24	F	4	4.8	109
25	M	4	4.5	110
26	M	4	3.8	87
27	M	4	3.8	105
28	M	4	2.7	70
29	F	4	4.6	97
30	F	4	4.0	91
31	F	4	3.7	111
32	F	4	3.5	No score
33	M	6	9.3	118
34	M	6	9.0	116
35	M	6	8.7	102
36	M	6	6.9	94
37	F	6	10.4	112
38	F	6	10.3	106

* See Appendix F

Waterloo Subject's Code Number, Sex, Grade Level,

Reading Grade Level and IQ Score, cont.

Code	Sex	Grade	Reading Score*	IQ Score*
39	F	6	8.6	112
40	F	6	7.6	106
41	M	6	6.5	120
42	M	6	6.4	104
43	M	6	6.2	96
44	M	6	5.7	94
45	F	6	6.4	114
46	F	6	6.2	113
47	F	6	6.0	99
48	F	6	4.3	88

* See Appendix F

Appendix E

The Study

Subject's Code Number, Sex, Grade Level, School,

Reading Score and IQ Score

Investigation Two: Subject's Code Number, Sex,

Grade Level, Reading Score and IQ Score

Code	Sex	Grade	School	Reading Score*	IQ Score*
1	M	2	Seneca	3.8	119
2	M	2	Seneca	2.9	101
3	M	2	Seneca	2.7	98
4	M	2	Seneca	2.5	95
5	F	2	Seneca	3.9	116
6	F	2	Seneca	4.0	145
7	M	2	Seneca	2.6	131
8	M	2	Seneca	2.4	103
9	F	2	Seneca	2.1	100
10	F	2	Seneca	2.8	107
11	M	2	Seneca	2.2	97
12	F	2	Seneca	2.1	101
13	M	2	Seneca	2.1	124
14	M	4	Seneca	2.1	97
15	M	4	Seneca	4.3	110
16	M	4	Seneca	3.0	95
17	M	4	Seneca	4.0	101
18	M	4	Seneca	5.1	104
19	M	4	Seneca	5.1	113

*See Appendix F

Code	Sex	Grade	School	Reading Score	IQ Score
20	M	4	Seneca	6.2	117
21	F	4	Seneca	6.2	106
22	F	4	Seneca	3.4	105
23	M	4	Seneca	4.2	113
24	F	4	Seneca	4.5	110
25	F	4	Seneca	6.5	150
26	F	6	Seneca	8.7	127
27	F	6	Seneca	6.5	115
28	M	6	Seneca	8.6	No score
29	M	6	Seneca	8.4	122
30	M	6	Seneca	6.7	96
31	F	6	Seneca	6.4	113
32	M	6	Seneca	7.7	116
33	F	6	Seneca	9.1	134
34	F	6	Seneca	6.0	122
35	M	6	Seneca	3.6	109
36	M	6	Seneca	5.7	96
37	M	6	Seneca	8.0	123
38	M	6	Seneca	7.0	110
39	F	6	Seneca	7.0	121
40	F	6	Seneca	5.4	107
41	M	6	Seneca	3.8	92
42	F	6	Seneca	7.5	115
43	M	6	Seneca	7.8	112
44	F	6	Seneca	7.8	120

Code	Sex	Grade	School	Reading Score	IQ Score
45	F	6	Seneca	7.2	117
46	M	6	Seneca	6.2	105
47	F	6	Seneca	6.3	96
48	F	6	Seneca	6.2	114
49	F	6	Seneca	8.2	120
50	F	6	Seneca	8.0	116
51	M	6	Seneca	6.5	106
52	F	6	Seneca	8.7	115
53	M	6	Seneca	5.4	98
54	M	6	Seneca	6.8	112
55	F	6	Seneca	6.7	115
56	F	6	Seneca	7.4	116
57	F	6	Seneca	8.3	130
58	F	6	Seneca	5.5	102
59	F	4	Seneca	5.6	120
60	M	4	Seneca	5.0	115
61	M	4	Seneca	4.3	117
62	M	4	Seneca	5.9	120
63	F	4	Seneca	6.2	114
64	F	4	Seneca	3.5	109
65	M	4	Seneca	4.7	108
66	M	4	Seneca	5.7	111
67	F	4	Seneca	4.8	95
68	M	4	Seneca	4.2	98

Code	Sex	Grade	School	Reading Score	IQ Score
69	M	4	Seneca	4.5	107
70	F	4	Seneca	4.4	103
71	F	4	Seneca	5.2	126
72	F	4	Seneca	4.8	108
73	F	4	Seneca	5.4	113
74	F	4	Seneca	4.3	109
75	M	4	Seneca	5.5	116
76	M	4	Seneca	4.8	128
77	F	4	Seneca	4.5	104
78	F	4	Seneca	4.2	112
79	M	4	Seneca	3.3	87
80	F	4	Seneca	3.9	96
81	M	4	Seneca	4.6	98
82	M	4	Seneca	3.6	86
83	F	2	Seneca	4.1	131
84	M	2	Seneca	4.1	141
85	F	2	Seneca	3.9	139
86	M	2	Seneca	3.7	116
87	M	2	Seneca	3.5	114
88	F	2	Seneca	3.5	122
89	M	2	Seneca	3.2	120
90	F	2	Seneca	3.1	112
91	M	2	Seneca	2.9	139
92	M	2	Seneca	2.8	131

Code	Sex	Grade	School	Reading Score	IQ Score
93	M	2	Seneca	2.8	90
94	M	2	Seneca	2.8	137
95	F	2	Seneca	2.7	114
96	F	2	Seneca	2.7	105
97	F	2	Seneca	2.6	108
98	F	2	Seneca	2.6	119
99	F	2	Seneca	2.6	103
100	M	2	Seneca	2.5	131
101	M	2	Seneca	2.5	104
102	M	2	Seneca	2.4	108
103	M	2	Seneca	2.4	119
104	M	2	Seneca	1.9	96
105	F	2	Seneca	1.7	91
106	M	2	Seneca	1.5	107
107	F	6	Seneca	5.1	106
108	F	6	Seneca	6.6	108
109	M	6	Seneca	6.0	110
110	F	2	Cedarburg	2.6	112
111	M	2	Cedarburg	2.1	100
112	M	2	Cedarburg	2.6	97
113	F	2	Cedarburg	3.9	93
114	F	2	Cedarburg	2.0	93
115	M	2	Cedarburg	3.1	109
116	F	2	Cedarburg	3.9	110

Code	Sex	Grade	School	Reading Score	IQ Score
117	M	2	Cedarburg	2.0	105
118	M	2	Cedarburg	3.8	112
119	M	2	Cedarburg	2.3	114
120	M	2	Cedarburg	4.3	104
121	F	2	Cedarburg	2.6	118
122	M	2	Cedarburg	3.6	109
123	M	2	Cedarburg	3.7	114
124	F	2	Cedarburg	2.6	101
125	F	2	Cedarburg	4.1	119
126	M	2	Cedarburg	1.5	92
127	F	2	Cedarburg	3.4	109
128	F	2	Cedarburg	1.9	93
129	M	2	Cedarburg	2.5	103
130	F	2	Cedarburg	1.8	99
131	M	2	Cedarburg	3.1	104
132	F	2	Cedarburg	3.3	116
133	F	2	Cedarburg	2.6	104
134	F	2	Cedarburg	1.6	104
135	M	2	Cedarburg	3.4	119
136	M	2	Cedarburg	1.9	104
137	F	2	Cedarburg	3.8	123
138	F	2	Cedarburg	2.2	123
139	M	2	Cedarburg	1.5	111
140	F	2	Cedarburg	3.3	116

Code	Sex	Grade	School	Reading Score	IQ Score
141	M	2	Cedarburg	1.5	No score
142	F	2	Cedarburg	1.7	116
143	M	2	Cedarburg	2.2	130
144	F	2	Cedarburg	1.7	No score
145	F	2	Cedarburg	2.5	115
146	M	2	Cedarburg	1.8	95
147	M	2	Cedarburg	1.6	87
148	F	2	Cedarburg	3.4	115
149	F	2	Cedarburg	2.9	118
150	F	2	Cedarburg	3.8	116
151	F	2	Cedarburg	1.7	110
152	F	2	Cedarburg	1.5	106
153	F	2	Cedarburg	1.9	98
154	F	2	Cedarburg	2.2	112
155	M	2	Cedarburg	1.9	113
156	F	2	Cedarburg	No score	No score
157	M	2	Cedarburg	1.5	109
158	F	2	Cedarburg	2.1	122
159	M	2	Cedarburg	3.4	128
160	F	2	Cedarburg	1.5	103
161	M	2	Cedarburg	1.8	114
162	F	2	Cedarburg	2.0	124
163	M	2	Cedarburg	1.7	107
164	F	2	Cedarburg	4.3	127

Code	Sex	Grade	School	Reading Score	IQ Score
165	M	2	Cedarburg	1.9	117
166	F	2	Cedarburg	1.9	132
167	M	4	Cedarburg	5.0	104
168	F	4	Cedarburg	4.6	106
169	F	4	Cedarburg	No score	No score
170	F	4	Cedarburg	3.2	97
171	F	4	Cedarburg	3.4	87
172	F	4	Cedarburg	5.1	102
173	M	4	Cedarburg	2.9	96
174	M	4	Cedarburg	5.4	115
175	F	4	Cedarburg	4.9	116
176	M	4	Cedarburg	4.4	99
177	F	4	Cedarburg	3.6	94
178	M	4	Cedarburg	6.0	107
179	M	4	Cedarburg	4.2	108
180	M	4	Cedarburg	3.1	86
181	F	4	Cedarburg	6.3	117
182	M	4	Cedarburg	3.3	97
183	F	4	Cedarburg	5.9	104
184	F	4	Cedarburg	5.0	114
185	F	4	Cedarburg	4.9	87
186	F	4	Cedarburg	5.3	107
187	M	4	Cedarburg	4.2	84
188	F	4	Cedarburg	2.1	83

Code	Sex	Grade	School	Reading Score	IQ Score
189	M	4	Cedarburg	3.4	94
190	F	4	Cedarburg	4.8	106
191	F	4	Cedarburg	4.7	115
192	F	4	Cedarburg	5.1	96
193	M	4	Cedarburg	6.1	119
194	M	4	Cedarburg	4.4	97
195	M	4	Cedarburg	No score	No score
196	M	4	Cedarburg	6.1	122
197	M	4	Cedarburg	3.4	81
198	M	4	Cedarburg	5.9	114
199	F	4	Cedarburg	6.7	129
200	M	4	Cedarburg	5.4	112
201	M	4	Cedarburg	4.4	115
202	M	4	Cedarburg	5.2	109
203	M	4	Cedarburg	4.7	100
204	F	4	Cedarburg	4.1	100
205	M	4	Cedarburg	1.7	64
206	M	4	Cedarburg	6.1	119
207	F	4	Cedarburg	5.1	101
208	M	4	Cedarburg	3.8	91
209	F	4	Cedarburg	5.0	102
210	M	4	Cedarburg	5.4	118
211	F	4	Cedarburg	6.5	124
212	F	4	Cedarburg	3.3	104

Code	Sex	Grade	School	Reading Score	IQ Score
213	M	4	Cedarburg	3.2	100
214	M	4	Cedarburg	2.4	70
215	M	4	Cedarburg	4.7	99
216	F	4	Cedarburg	5.3	116
217	F	4	Cedarburg	5.9	118
218	F	4	Cedarburg	4.8	107
219	M	4	Cedarburg	3.8	103
220	F	4	Cedarburg	5.8	121
221	M	4	Cedarburg	6.7	125
222	M	4	Cedarburg	4.8	109
223	M	4	Cedarburg	3.4	101
224	F	4	Cedarburg	2.0	100
225	M	4	Cedarburg	4.8	89
226	F	4	Cedarburg	3.4	103
227	F	6	Cedarburg	6.3	88
228	M	6	Cedarburg	6.4	93
229	F	6	Cedarburg	7.2	111
230	F	6	Cedarburg	6.9	118
231	F	6	Cedarburg	6.5	104
232	M	6	Cedarburg	7.9	129
233	F	6	Cedarburg	7.2	103
234	F	6	Cedarburg	7.1	122
235	M	6	Cedarburg	3.4	89
236	M	6	Cedarburg	7.8	96

Code	Sex	Grade	School	Reading Score	IQ Score
237	F	6	Cedarburg	7.8	121
238	F	6	Cedarburg	5.7	99
239	F	6	Cedarburg	6.2	104
240	M	6	Cedarburg	6.6	103
241	F	6	Cedarburg	7.4	118
242	M	6	Cedarburg	6.0	No score
243	F	6	Cedarburg	8.0	112
244	M	6	Cedarburg	6.5	103
245	M	6	Cedarburg	7.9	139
246	F	6	Cedarburg	10.0	127
247	F	6	Cedarburg	8.1	119
248	M	6	Cedarburg	8.2	112
249	M	6	Cedarburg	5.7	86
250	M	6	Cedarburg	6.8	121
251	M	6	Cedarburg	7.5	104
252	M	6	Cedarburg	8.2	114
253	M	6	Cedarburg	4.9	89
254	M	6	Cedarburg	No score	No score
255	M	6	Cedarburg	7.3	No score
256	F	6	Cedarburg	8.3	120
257	M	6	Cedarburg	5.6	100
258	M	6	Cedarburg	6.2	114
259	M	6	Cedarburg	8.7	115
260	M	6	Cedarburg	5.5	114

Code	Sex	Grade	School	Reading Score	IQ Score
261	M	6	Cedarburg	5.8	98
262	M	6	Cedarburg	4.2	96
263	F	6	Cedarburg	7.1	125
264	F	6	Cedarburg	9.4	133
265	F	6	Cedarburg	8.5	117
266	F	6	Cedarburg	8.2	110
267	M	6	Cedarburg	6.0	104
268	F	6	Cedarburg	6.9	93
269	M	6	Cedarburg	8.2	105
270	M	6	Cedarburg	4.4	111
271	M	6	Cedarburg	7.8	115
272	M	6	Cedarburg	6.4	95
273	M	6	Cedarburg	8.8	134
274	F	6	Cedarburg	7.0	114
275	F	6	Cedarburg	9.0	120
276	M	6	Cedarburg	6.0	91
277	F	6	Cedarburg	5.5	100
278	M	6	Cedarburg	4.9	100
279	F	6	Cedarburg	9.2	120
280	F	6	Cedarburg	4.9	100
281	F	6	Cedarburg	5.5	100
282	F	6	Cedarburg	8.4	117
283	M	6	Cedarburg	5.6	106
284	F	6	Cedarburg	No score	130

Code	Sex	Grade	School	Reading Score	IQ Score
285	M	6	Cedarburg	No score	135
286	F	6	Cedarburg	5.6	115
287	M	4	Racine	2.5	90
288	M	4	Racine	No score	No score
289	M	4	Racine	No score	125
290	M	4	Racine	2.0	101
291	M	4	Racine	3.3	91
292	M	4	Racine	No score	103
293	M	4	Racine	2.1	105
294	M	4	Racine	2.1	110
295	M	4	Racine	3.0	92
296	M	4	Racine	2.3	99
297	M	4	Racine	2.9	101
298	M	4	Racine	No score	77
299	M	4	Racine	2.5	98
300	M	4	Racine	1.7	105
301	F	4	Racine	No score	113
302	F	4	Racine	No score	104
303	F	4	Racine	2.4	77
304	F	4	Racine	4.0	106
305	F	4	Racine	2.8	101
306	F	4	Racine	5.1	126
307	F	4	Racine	5.7	136
308	F	4	Racine	5.1	115

Code	Sex	Grade	School	Reading Score	IQ Score
309	F	4	Racine	4.0	114
310	F	4	Racine	2.8	109
311	F	4	Racine	No score	104
312	M	6	Racine	5.2	103
313	M	6	Racine	No score	89
314	M	6	Racine	5.4	105
315	M	6	Racine	No score	99
316	M	6	Racine	5.1	102
317	M	6	Racine	5.6	95
318	M	6	Racine	6.2	No score
319	M	6	Racine	6.4	106
320	M	6	Racine	5.1	80
321	M	6	Racine	9.6	117
322	M	6	Racine	4.6	89
323	M	6	Racine	9.0	92
324	M	6	Racine	4.2	90
325	M	6	Racine	5.2	85
326	M	6	Racine	No score	No score
327	F	6	Racine	4.1	98
328	F	6	Racine	5.1	78
329	F	6	Racine	8.0	108
330	F	6	Racine	7.8	110
331	F	6	Racine	4.9	85
332	F	6	Racine	4.6	93

Code	Sex	Grade	School	Reading Score	IQ Score
333	F	6	Racine	4.8	95
334	F	6	Racine	5.1	105
335	F	6	Racine	No score	No score
336	M	2	Racine	1.8	116
337	M	2	Racine	1.5	93
338	M	2	Racine	No score	No score
339	M	2	Racine	No score	100
340	M	2	Racine	1.3	85
341	M	2	Racine	1.3	86
342	M	2	Racine	1.9	120
343	M	2	Racine	1.6	100
344	M	2	Racine	1.5	97
345	M	2	Racine	0.5	76
346	M	2	Racine	1.5	109
347	M	2	Racine	1.6	93
348	M	2	Racine	No score	101
349	M	2	Racine	1.7	95
350	M	2	Racine	1.3	96
351	M	2	Racine	1.6	103
352	F	2	Racine	1.9	103
353	F	2	Racine	1.7	101
354	F	2	Racine	1.8	111
355	F	2	Racine	1.4	104
356	F	2	Racine	1.6	123

Code	Sex	Grade	School	Reading Score	IQ Score
357	F	2	Racine	1.6	124
358	F	2	Racine	1.0	101
359	F	2	Racine	1.5	94
360	F	2	Racine	1.5	99
361	F	2	Racine	2.0	127
362	M	2	Racine	1.8	130
363	F	2	Racine	1.5	110
364	F	2	Racine	1.5	119
365	M	2	Racine	1.8	121
366	F	2	Racine	2.0	127
367	M	2	Racine	1.7	108
368	M	2	Racine	1.3	117
369	F	2	Racine	1.5	95
370	F	2	Racine	1.7	119
371	F	2	Racine	1.8	114
372	F	2	Racine	1.7	105
373	F	2	Racine	1.7	95
374	M	2	Racine	2.6	137
375	F	2	Racine	1.9	115
376	M	2	Racine	1.6	96
377	F	2	Racine	1.5	112
378	M	2	Racine	1.7	126
379	F	2	Racine	2.2	114
380	M	2	Racine	1.6	115

Code	Sex	Grade	School	Reading Score	IQ Score
381	M	2	Racine	1.4	124
382	F	2	Racine	2.6	124
383	M	2	Racine	2.7	120
384	F	2	Racine	No score	102
385	F	6	Racine	7.1	123
386	M	6	Racine	7.5	No score
387	F	6	Racine	6.4	135
388	M	6	Racine	5.6	97
389	M	6	Racine	8.0	97
390	M	6	Racine	6.7	96
391	M	6	Racine	5.9	108
392	M	6	Racine	5.1	106
393	F	6	Racine	7.3	110
394	F	6	Racine	5.9	106
395	F	6	Racine	5.1	106
396	M	6	Racine	6.9	108
397	M	6	Racine	6.6	112
398	F	6	Racine	6.0	107
399	M	6	Racine	6.9	98
400	F	6	Racine	8.5	117
401	M	6	Racine	6.6	99
402	M	6	Racine	7.1	122
403	M	6	Racine	6.6	111
404	M	6	Racine	6.7	117

Code	Sex	Grade	School	Reading Score	IQ Score
405	F	6	Racine	7.1	99
406	M	6	Racine	5.2	108
407	F	6	Racine	7.1	101
408	F	6	Racine	5.9	96
409	F	6	Racine	8.0	127
410	M	6	Racine	6.9	113
411	M	6	Racine	6.0	100
412	F	6	Racine	7.1	127
413	F	6	Racine	5.7	97
414	M	6	Racine	5.1	94
415	M	6	Racine	6.2	105
416	M	6	Racine	6.6	103
417	M	6	Racine	5.7	89
418	M	6	Racine	8.5	117
419	F	6	Racine	6.0	124
420	M	6	Racine	3.8	No score
421	F	6	Racine	4.1	105
422	M	6	Racine	6.9	No score
423	F	6	Racine	5.6	102
424	M	6	Racine	8.0	100
425	F	6	Racine	6.6	116
426	M	4	Racine	3.7	110
427	M	4	Racine	4.7	100
428	M	4	Racine	No score	68

Code	Sex	Grade	School	Reading Score	IQ Score
429	M	4	Racine	4.4	104
430	M	4	Racine	3.8	121
431	M	4	Racine	No score	136
432	M	4	Racine	2.7	124
433	M	4	Racine	3.6	118
434	M	4	Racine	5.1	127
435	M	4	Racine	3.8	No score
436	M	4	Racine	3.8	110
437	M	4	Racine	4.4	120
438	M	4	Racine	3.7	115
439	M	4	Racine	3.7	106
440	M	4	Racine	4.0	112
441	M	4	Racine	3.6	112
442	M	4	Racine	2.3	117
443	M	4	Racine	No score	86
444	M	4	Racine	3.8	116
445	F	4	Racine	No score	141
446	F	4	Racine	5.7	125
447	F	4	Racine	3.3	111
448	F	4	Racine	2.9	120
449	F	4	Racine	3.3	121
450	F	4	Racine	3.6	133
451	F	4	Racine	3.6	127
452	F	4	Racine	4.7	122
453	F	4	Racine	4.4	140

Appendix F

Summary of Reading Achievement Tests, Intelligence Tests and Dates of Administration to the Subjects of Pilot Studies A and B and The Study

Tests

School	Reading Achievement Test	Date of Testing	Grade Level at Testing	IQ Test	Date of Testing
Waterloo					
2	Gates McGinty Primary A	5/68	(1)	Lorge-Thorndike	5/68
4	Nelson Reading A	5/68	(3)	Lorge-Thorndike	5/68
6	Nelson Reading A	5/68	(5)	Lorge-Thorndike	5/68
Seneca					
2	SRA	1/69	(2)	Otis Quick	3/69
4	Iowa Basic	2/69	(4)	Hermon-Nelson	4/68
6	Iowa Basic	2/69	(6)	Hermon-Nelson	4/68

Tests, cont.

School	Reading Achievement Test	Date of Testing	Grade Level at Testing	IQ Test	Date of Testing
Cedarburg					
2	Stanford Achievement	10/68	(2)	Primary Abilities	9/67
4	Iowa Basic	10/68	(4)	Lorge-Thorndike	10/68
6	Iowa Basic	10/68	(6)	Lorge-Thorndike	10/68
Racine					
2	Stanford Achievement	10/68	(2)	Kuhlman-Anderson	12/68
4	Stanford Achievement	10/67	(3)	Kuhlman-Anderson	12/68
6	Stanford Achievement	12/68	(6)	Kuhlman-Anderson	12/67

Appendix G

F Values of Main Effects and Interactions

for Analysis One

Appendix G

F Values of Main Effects and Interactions for Analysis One

Source of Variation	Degrees of Freedom	Mean Squares	F Values	P less than
Between				
Grade Level	2,400	1042873	93.2776	.01
Sex	1,400	29010.7	2.5948	NS
Reading Level	1,400	466808	41.7527	.01
Community Type	2,400	72453	6.4804	.01
G x S	2,400	3091	.2765	NS
G x R	2,400	3369	.3012	NS
*G x C	4,400	40786	3.6480	.01
S x R	1,400	391	.0350	NS
S x C	2,400	26078	2.3325	NS
R x C	2,400	17646	1.5783	NS
G x S x R	2,400	10130	.9061	NS
G x S x C	4,400	6130	.5483	NS
G x R x C	4,400	7887	.7054	NS
S x R x C	2,400	30788	2.7538	NS
G x S x R x C	4,400	13962	1.2488	NS
Wholly Within				
Vowel Clusters	1,400	96795	340.8036	.01
Response Type	1,400	13090	2.3539	NS
V C x T	1,400	40904	199.4929	.01
Between by Within				
Grade x V C	2,400	2372.6	8.3535	.01
Sex x V C	1,400	530.6	1.8686	NS
Reading Level x V C	1,400	1899.8	6.6888	.01

Appendix G (Cont.)

Source of Variation	Degrees of Freedom	Mean Squares	F Values	P less than
Community x V C	2,400	855.7	3.0128	NS
G x T	2,400	439053.9	78.9498	.01
S x T	1,400	27065.7	4.8669	NS
R x T	1,400	230587.6	41.4638	.01
C x T	2,400	36937.2	6.6421	.01
G x VC x T	2,400	3937.2	19.2022	.01
S x VC x T	1,400	102	.4976	NS
R x VC x T	1,400	1005	4.9015	NS
C x VC x T	2,400	1109.4	5.4108	.01
G x S x VC	2,400	463.6	1.6321	NS
G x R x VC	2,400	430.3	1.5150	NS
G x C x VC	4,400	503.5	1.7728	NS
S x R x VC	1,400	389.8	1.3725	NS
S x C x VC	2,400	399	1.4049	NS
R x C x VC	2,400	125.1	0.4403	NS
G x S x T	2,400	5706.9	1.0262	NS
G x R x T	2,400	1986.5	.3572	NS
G x C x T	4,400	12747.3	2.2922	NS
S x R x T	1,400	173	.0391	NS
S x C x T	2,400	18759.5	3.3733	NS
R x C x T	2,400	6470.4	1.1635	NS
G x S x VC x T	2,400	241.6	1.1782	NS
G x R x VC x T	2,400	288.1	1.4055	NS
G x C x VC x T	4,400	465.8	2.2719	NS
S x R x VC x T	1,400	114.1	.5863	NS

Appendix G (Cont.)

Source of Variation	Degrees of Freedom	Mean Squares	F Values	P less than
S x C x VC x T	2,400	317.6	1.5499	NS
R x S x VC x T	2,400	150.9	.7361	NS
C x S x R x VC	2,400	177.3	.6242	NS
G x S x C x VC	4,400	166.3	.5854	NS
G x R x C x VC	4,400	255.5	.8997	NS
S x R x C x VC	2,400	291.6	1.0266	NS
G x S x R x T	2,400	1735.1	.3120	NS
G x S x C x T	4,400	1765.7	.3975	NS
G x R x C x T	4,400	4545.2	.8173	NS
S x R x C x T	2,400	19191.6	3.4810	NS
G x S x R x VC x T	2,400	262.8	1.2818	NS
G x S x C x VC x T	4,400	168.3	.8208	NS
G x R x C x VC x T	4,400	222.2	1.0836	NS
S x R x C x VC x T	2,400	291.8	1.4233	NS
G x S x R x C x VC	4,400	363.2	1.2787	NS
G x S x R x C x T	4,400	3512.4	.6316	NS
G x S x R x C x VC x T	4,400	159.1	.7761	NS

Appendix H

F Values of Main Effects and Interactions for Analysis Two

Appendix H

F Values of Main Effects and Interactions for Analysis Two

Source of Variation	Degrees of Freedom	Mean Squares	F Values	P less than
Between				
Grade	2,400	703865.82	72.439	.01
Sex	1,400	31711.21	3.264	NS
Reading Level	1,400	373501.70	38.439	.01
Community Type	2,400	76242.73	7.847	.01
G x S	2,400	9833.52	1.012	NS
G x R	2,400	13340.55	1.373	NS
G x C	4,400	33367.60	3.434	.01
S x R	1,400	43.62	.0045	NS
S x C	2,400	21429.27	2.205	NS
R x C	2,400	15426.98	1.588	NS
G x S x R	2,400	7063.19	.727	NS
G x S x C	4,400	7094.43	.730	NS
G x R x C	4,400	5440.67	.560	NS
S x R x C	2,400	20370.52	2.096	NS
G x S x R x C	4,400	8873.20	.913	NS
Wholly Within				
Vowel Cluster	1,400	215119.39	317.2068	.01
Response Type	1,400	5404639.56	528.9131	.01
VC x T	1,400	4866364.50	1803.7156	.01
Between x Within				
G x VC	2,400	13237.63	19.5196	.01
S x VC	1,400	966.46	1.4250	NS

Appendix H (Cont.)

Source of Variation	Degrees of Freedom	Mean Squares	F Values	P less than
R x VC	1,400	1547.97	2.2825	NS
C x VC	2,400	882.77	1.3016	NS
G x T	2,400	675732.22	66.1290	.01
S x T	1,400	2145.23	.2099	NS
R x T	1,400	164410.35	16.0897	.01
C x T	2,400	127006.53	12.4292	.01
G x VC x T	2,400	109272.60	40.5087	.01
S x VC x T	1,400	6377.83	2.3639	NS
R x VC x T	1,400	60088.49	22.2717	.01
C x VC x T	2,400	19321.37	7.1614	.01
G x S x VC	2,400	1118.41	1.6491	NS
G x R x VC	2,400	423.89	.6250	NS
G x C x VC	4,400	2110.82	3.1124	NS
S x R x VC	1,400	930.88	1.3726	NS
S x C x VC	2,400	3239.42	4.7767	.01
R x C x VC	2,400	321.98	.4747	NS
G x S x T	2,400	724.69	.0709	NS
G x R x T	2,400	7891.56	.7723	NS
G x C x T	4,400	39480.82	3.8637	.01
S x R x T	1,400	18600.25	1.8203	NS
S x C x T	2,400	19115.55	1.8707	NS
R x C x T	2,400	7250.10	.7095	NS
G x S x VC x T	2,400	3162.13	1.2776	NS
G x R x VC x T	2,400	2558.28	.9482	NS

Appendix H (Cont.)

Source of Variation	Degrees of Freedom	Mean Squares	F Values	P less than
G x C x VC x T	4,400	3941.57	1.4609	NS
S x R x VC x T	1,400	540.37	.2002	NS
S x C x VC x T	2,400	3195.59	1.1844	NS
R x C x VC x T	2,400	2347.00	.8699	NS
G x S x R x VC	2,400	683.37	1.0076	NS
G x S x C x VC	4,400	643.59	.9490	NS
G x R x C x VC	4,400	647.75	.9949	NS
S x R x C x VC	2,400	988.55	1.4576	NS
G x S x R x T	2,400	3500.44	.3426	NS
G x S x C x T	4,400	6624.72	.6483	NS
G x R x C x T	4,400	7085.38	.6934	NS
S x R x C x T	2,400	33523.92	3.2807	NS
G x S x R x VC x T	2,400	1822.98	.6797	NS
G x S x C x VC x T	4,400	3240.20	1.2009	NS
G x R x C x VC x T	4,400	3576.80	1.3257	NS
S x R x C x VC x T	2,400	4894.48	1.8141	NS
G x S x R x C x VC	4,400	484.98	.7151	NS
G x S x R x C x T	4,400	12283.64	1.2021	NS
G x S x R x C x VC x T	4,400	4633.5462	1.7174	NS

Appendix I

Certain assumptions underlie the use of analysis of variance. They include: normality in distribution of errors, homogeneity of variance, and independence of errors within and across treatment combinations. Hayes, Box, (318-335) and Geisser and Greenhouse (885-891) have found that violation of these assumptions can be accommodated by the reduction of degrees of freedom. They recommend a conservative F test by reducing the degrees of freedom, and Geisser-Greenhouse have developed a procedure for this. Edwards supports this concept (p. 102) by advocating a conservative test using a maximum reduction in the number of degrees of freedom.

Using the Geisser-Greenhouse corrections on degrees of freedom with the Within and Between x Within portions of the analyses (see Appendices G and H), this investigator accounted for any possible violations of the underlying ANOVA assumptions. Geisser-Greenhouse corrections, however, were not used with the Between cells components of the analyses. However, it can be seen from the following two tables that the only violation of the assumption of homogeneity of variance was with the Grade Six cells on both analyses.

Standard Deviations in Analysis One (Type)

Source	N	Means	Standard Deviations	Variance
Grade 2	133	.18670+03	.13022+03	.16956+05
Grade 4	142	.67993+02	.11623+03	.13509+05
Grade 6	161	.20478+02	.94903+02	.90066+04
Male	240	.93250+02	.13610+03	.18524+05
Female	196	.78641+02	.12855+03	.16524+05
Low Reading	202	.12304+03	.13904+03	.19332+05
High Reading	234	.55248+02	.11851+03	.14045+05
Suburban	162	.64222+02	.12096+03	.14631+05
Urban	165	.10488+03	.14609+03	.21342+05
Rural	109	.92413+02	.12400+03	.15375+05

Standard Deviations in Analysis (Token)

Source	N	Mean	Standard Deviations	Variance
Grade 2	133	.13671+03	.12657+03	.16020+05
Grade 4	142	.38317+02	.10843+03	.11758+05
Grade 6	161	.37888+00	.81622+02	.66621+04
Male	240	.61375+02	.12594+03	.15860+05
Female	196	.45689+02	.11161+03	.12457+05
Low Reading	202	.86837+02	.12570+03	.15800+05
High Reading	234	.26256+02	.10710+03	.11470+05
Suburban	162	.34333+02	.11227+03	.12604+05
Urban	165	.75182+02	.13145+03	.17278+05
Rural	109	.52459+02	.10743+03	.11541+05

Even though the assumption was violated with the grade level variable, the F values were so highly significant that one can place reliance on the significant findings of this study. P less than .01 was the selected level of significance in both analyses (type and token). As can be seen from the following table, the levels for the significant Between cells main effects and interactions were much greater than .01.

F Values and P Levels for Significant Between Cells Main Effects and Interactions on Analysis One (Type) and Analysis Two (Token)

Analysis One (Type)

Source of Variance	F	P less than
Grade Level	93.2776	.0001
Reading Level	41.7527	.0001
Community Type	6.4804	.0017
G X CT	3.6480	.0063

Analysis Two (Type)

Grade Level	72.439	.0001
Reading Level	38.439	.0001
Community Type	7.847	.0005
G X CT	3.434	.0090

BIBLIOGRAPHY

BIBLIOGRAPHY

Abercrombie, David. "What is a 'Letter'?" Lingua 2: 1949, pp. 15-20.

Betts, E. "A New Area--Reading and Linguistics." Education: May, 1964.

Bishop, C. H. "Transfer Effects of Word and Letter Training in Reading." Journal of Verbal Learning and Verbal Behavior, 3: 1964, pp. 215-221.

Bloomfield, L. & Barnhart, C. Let's Read, A Linguistic Approach. Detroit: Wayne State University Press, 1961.

Bronstein, A. J. The Pronunciation of American English. New York: Appleton-Century-Crofts, Inc., 1960.

Burmeister, L. E. "Selected Word Analysis Generalizations for a Group Approach to Corrective Reading in the Secondary School." Reading Research Quarterly--IV/1: (Fall, 1968) pp. 71-95.

Burmeister, L. E. "Vowel Pairs." The Reading Teacher, Volume 21, Number 5: February, 1968, pp. 445-452.

Burns, P. C. "Linguistics--A Brief Guide for Principals." The National Elementary Principal 40: (September, 1965), pp. 37-42.

Calfee, R. C., Venezky, R. L., & Chapman, R. S. Pronunciation of Synthetic Words with Predictable and Unpredictable Letter-Sound Correspondences. (Technical Report No. 71) Madison: The University of Wisconsin, 1968.

Chall, J. Learning to Read: The Great Debate. New York: McGraw-Hill, 1967.

Chomsky, N. A. Syntactic Structures. Gravenhage. Mouton & Company, 1957.

Clymer, T. "Decoding." Reading Newsreport. Vol. 3, No. 3: (November, 1968).

Diringer, D. Writing: Its Origin and Early History. New York: Praeger, 1962.

Dobson, Eric J. English Pronunciation 1500 - 1700. 2 Vols., Oxford: 1957.

Durkin, D. Teach Them To Read. New York: Allyn and Bacon, 1970.

Dykstra, R. "Summary of the Second Grade Phase of the Cooperative Research Program in Primary Reading Institutions". Reading Research Quarterly. Vol. IV, No. 1, 1968.

Edwards, A. L. Experimental Design in Psychological Research. New York: Holt, Rinehart and Winston, Inc., 1968.

Fries, C. Linguistics and Reading. New York: Holt, Rinehart and Winston, 1963.

Goodman, K. "The Linguistics of Reading." The Elementary School Journal. April 1964, pp. 355-361.

Hall, R ., Jr. Sound and Spelling in English. Philadelphia: Chilton Co., 1961.

Hanna, P. R. et.al. Phoneme-Grapheme Correspondences as Cues to Spelling Improvement. (USOE Research Program Monograph 16.) Washington, D. C.: Government Printing Office, 1966.

Holmberg, Borje. James Douglas on English Pronunciation C-1740. Lund Studies in English XXVI. Lund: 1956.

Hockett, C. F. A Course in Modern Linguistics. New York: Macmillan, 1958.

Kenyon, J. S. and Knott, T. A. A Pronouncing Dictionary of American English. Springfield: G. & C. Merriam Co., 1953.

Kerlinger, F. Foundations of Behavioral Research. New York: Holt, Rinehart and Winston, Inc., 1967.

Kirk, R. E. Experimental Design: Procedures For The Behavioral Sciences. Belmont, California: Brooks/Cole Publishing Company, 1969.

Kucera, H. and Francis, N. W. Computational Analysis of Present-Day American English. Providence: Brown University Press, 1967.

Lamb, P. Guiding Children's Language Learning. New York: Brown and Company, 1968.

Levin, Harry, E. Gibson and J. Gibson. The Analysis of Reading Skill: A Program of Basic and Applied Research. (Final Report, Project No. 5-1213, Contract No. OE 6-10-156), Washington, D. C.: U.S. Office of Education, 1968.

Mathews, Mitford M. Teaching to Read Historically Considered. Chicago: The University of Chicago Press, 1966.

Preston, R. C. "Sex Differences in German Schools". School and Society. October, 1962.

Spache, George. Good Reading For Poor Readers. Champaign, Illinois: Garrard Press, 1960, pp. 120-122.

Thorndike, E. Thorndike-Century Senior Dictionary. New York: D. Appleton-Century, 1941.

Trager, G. L. and Smith, H. L. An Outline of English Structure. (Studies in Linguistics, Occasional Papers, No. 3). Reprinted, Washington, D. C.: American Council of Learned Societies, 1957.

Venezky, R. "A Computer Program for Deriving Spelling to Sound Correlations." In H. Levin (Ed.) A Basic Research Program on Reading. Ithaca: Cornell University, 1963.

Venezky, R. L. and Weir, R. H. A Study of Selected Spelling-to-Sound Correspondence Patterns. (Final Report, Cooperative Research Project No. 3090). Stanford: Stanford University, 1966.

Venezky, R. L. "The Basis of English Orthography." Acta Linguistica Hafniensia. Vol. X, No. 2, Copenhagen, 1967.

Venezky, R. L. "English Orthography: Its Graphical Structure and Its Relation to Sound." Reading Research Quarterly. II/3, (Spring, 1967), pp. 75-105.

Weber, R. M. "The Study of Oral Reading Errors: A Survey of the Literature." Reading Research Quarterly. IV/1, pp. 96-119, (Fall, 1968).

Weir, R. H. Formulation of Grapheme-Phoneme Correspondence Rules to Aid in the Teaching of Reading. (Final Report, Cooperative Research Project, No. S-039). Stanford: Stanford University, 1964.

Weir, R. H. and Venezky, R. L. Rules to Aid in the Teaching of Reading. (Final Report, Cooperative Research Project No. 2584). Stanford: Stanford University, 1965.